

## REMARKS

Claims 1, 6-19, 23, 24, and 26-28 are pending. Claims 6 and 7 have been amended to recite specific inherent viscosity of the ion exchange resin and porosity of the support membrane. These amendments are supported at least by the disclosures in page 44, lines 6-11 and page 44, line 22 to page 45, line 2 of the specification. Applicants submit that no new matter has been introduced. Claims 6 and 7 have also been amended to define “m” as an integer within a range of 1 to 1000. Amendments to claims 6 and 7 for editorial purposes have also been made. These editorial amendments do not narrow the scope of claims 6 or 7.

### **Claim Objections**

Claims 6 and 7 were objected to on the grounds that the parentheses after the Chemical Formulas 2A and 2B and Chemical Formulas 4 and 6 in claim 6 and the parentheses after the Chemical Formulas 2A and 2B and Chemical Formulas 3 and 7 in claim 7 should be deleted. Without conceding to the propriety of this rejection and in order to expedite prosecution, the parentheses after the chemical formulas in claims 6 and 7 have been deleted. Applicants respectfully request withdrawal of the objections to claims 6 and 7.

### **Claim Rejections -- 35 U.S.C. 112**

Applicants respectfully traverse the rejection of claims 6, 7, 23, 24, and 26-28 as being indefinite under 35 U.S.C. § 112, second paragraph.

Without conceding to the propriety of the rejections and in order to expedite prosecution, claim 6 has been amended to recite “wherein said Ar<sub>1</sub> in Chemical Formula 2A and said Ar<sub>3</sub> in Chemical Formula 2B each is a linking unit represented by Chemical Formula 6, said Ar<sub>2</sub> in Chemical Formula 2B is a linking unit represented by Chemical Formula 4 ...” Claim 7 has been amended to recite “wherein said Ar<sub>1</sub> in Chemical Formula 2A and said Ar<sub>3</sub> in Chemical Formula 2B each is a linking unit represented by Chemical Formula 7, said Ar<sub>2</sub> in Chemical Formula 2B is a linking unit represented by Chemical Formula 3 ...” An ordinary skilled in the art would understand that Chemical Formulas 4 and 6 and Chemical Formulas 3 and 7 represent the linking units, Ar<sub>1</sub>, Ar<sub>2</sub>, and Ar<sub>3</sub>, in Chemical Formulas 2A and 2B. Furthermore, without conceding to

the propriety of the rejections and in order to expedite prosecution, Claims 6 and 7 have been amended to recite “m represents an integer within a range of 1 to 1000.” Applicants respectfully submit that claims 6 and 7, as amended, are in compliance with the definiteness requirement of 35 U.S.C. § 112, second paragraph.

### **Claim Rejections -- 35 U.S.C. 102**

Applicants respectfully traverse the rejections of claims 6 and 7 as being anticipated by McGrath et al. (WO 02/25764 or US 2002/0091225).

McGrath does not disclose, explicitly or implicitly, each and every limitation in claim 6 or claim 7. For example, McGrath does not disclose that the porosity of the support membrane is not lower than 95%, as recited in amended claims 6 and 7.

In addition, McGrath does not disclose, explicitly or implicitly, a composite ion exchange membrane wherein Ar<sub>1</sub> in Chemical Formula 2A and Ar<sub>3</sub> in Chemical Formula 2B each is a linking unit represented by Chemical Formula 6 and wherein Ar<sub>2</sub> in Chemical Formula 2B is a linking unit represented by Chemical Formula 4, as recited in claim 6. Also, McGrath does not disclose, explicitly or implicitly, a composite ion exchange membrane wherein Ar<sub>1</sub> in Chemical Formula 2A and Ar<sub>3</sub> in Chemical Formula 2B each is a linking unit represented by Chemical Formula 7 and wherein Ar<sub>2</sub> in Chemical Formula 2B is a linking unit represented by Chemical Formula 3, as recited in amended claim 7.

The Office Action in page 6, the second and third paragraphs, states that the chemical structures of the sulfonated copolymer on page 3, line 4 to page 5, line 10 of McGrath are “substantially identical and contain all the limitation of instant claims 6 and 7.” Applicants respectfully disagree. The sulfonated copolymer of McGrath has a very different structure than the ion exchange resins recited in the present claims 6 and 7. For example, the sulfonated copolymer of McGrath does not contain a component represented by Chemical Formula 2A and 2B, wherein Ar<sub>1</sub> in Chemical Formula 2A and Ar<sub>3</sub> in Chemical Formula 2B each is a linking unit represented by Chemical Formula 6 and wherein Ar<sub>2</sub> in Chemical Formula 2B is a linking unit represented by Chemical Formula 4, as recited in instant claim 6. In other words, Chemical Formula 4 is not a component of the sulfonated copolymer of McGrath.

The sulfonated copolymer of McGrath does not have linking units represented by Chemical Formula 2A and 2B, wherein Ar<sub>1</sub> in Chemical Formula 2A and Ar<sub>3</sub> in Chemical Formula 2B each is a linking unit represented by Chemical Formula 7 and wherein Ar<sub>2</sub> in Chemical Formula 2B is a linking unit represented by Chemical Formula 3, as recited in instant claim 7.

The Office Action states that McGrath discloses a n/n+m range of from about 0.3 to about 6 (see Office Action, page 6, the second last paragraph). Applicants note that “n” and “m” in McGrath have different definitions from “n” and “m” in instant claims 6 and 7. In the present claim 6, n:m represents the ratio of the linking units represented by Chemical Formula 2A to the linking units represented by Chemical Formula 2B. As discussed above, the sulfonated copolymer of McGrath does not contain Chemical Formulas 2A and 2B with Ar<sub>1</sub>, Ar<sub>2</sub>, and Ar<sub>3</sub> as specified in present claims 6 and 7. Therefore, n/n+m in McGrath does not correspond to n/n+m in instant claims 6 and 7. McGrath does not teach or suggest that n/n+m, as defined in present claims, satisfy Mathematical Expressions 2 and 3, as recited in claims 6 and 7, respectively.

Furthermore, McGrath does not teach or suggest that the porosity of the support membrane is not lower than 95%, as recited in amended claims 6 and 7.

Because McGrath does not disclose, explicitly or implicitly, all limitations of claims 6 and 7, the present claims are not anticipated by McGrath. Withdrawal of the rejections is respectfully requested.

### **Claim Rejections -- 35 U.S.C. 103**

I. Applicants respectfully traverse the obviousness rejections of claims 6, 7, 23, 24, and 26-28 over Formato et al. (U.S. Patent 6,248,469 or WO 9/10165) in view of Fukuda et al. (U.S. Patent Application Publication 2002/0076594 A1) and Sakuma et al. (JP 2000-256486A)

The Office Action has not established a prima facie case of obviousness because Formato, Fukuda, and Sakuma, even when taken in combination, fail to teach or suggest every limitation of claim 6 or claim 7.

Claims 6 and 7, as amended, recite that “the porosity of the support membrane is not lower than 95%.” None of Formato, Fukuda and Sakuma teaches or suggests this limitation. Formato discloses that preferred polymer substrates have a porosity range from about 40% to

90% (col. 10, lines 6-8). The deficiency of Formato is not cured by Fukuda and Sakuma. Neither Fukuda nor Sakuma teaches or suggests a support membrane having a porosity of not lower than 95%.

Formato, Fukuda and Sakuma, even when taken in combination, do not teach or suggest an ion exchange resin composition comprising Chemical Formulas 2A and 2B, wherein Ar<sub>1</sub> in Chemical Formula 2A and Ar<sub>3</sub> in Chemical Formula 2B each has a structure represented by Chemical Formula 6 and Ar<sub>2</sub> in Chemical Formula 2B is represented by Chemical Formula 4, as recited in amended claim 6. Similarly, Formato, Fukuda, and Sakuma, fail to disclose an ion exchange resin composition comprising Chemical Formulas 2A and 2B, with Ar<sub>1</sub>, Ar<sub>2</sub>, and Ar<sub>3</sub> as defined in instant claim 7.

The Office Action states that the structures for certain polymers listed in tables 4-7 of Formato are substantially identical to the formulas of instant claims 6 and 7. Applicants disagree. For example, none of the structures in Tables 4-7 of Formato contains a component that is “substantially identical” to Chemical Formula 2B containing a component of Chemical Formula 4, as recited in present claim 6, or containing a component of Chemical Formula 7, as recited in claim 7.

With regard to Mathematical Expressions 2 and 3, the Office Action acknowledges that none of Formato, Fukuda and Sakuma teaches or suggests a composite ion exchange membrane comprising an ion exchange resin composition having a value of  $n/n+m$  that satisfies Mathematical Expression 2 or 3, as recited in claims 6 or 7 (see Office Action, page 8, the last paragraph). The Office Action then states that “in view of substantially identical structures of the polymers for ion exchange compositions between the combined teachings of Formato, Fukuda and Sakuma and instant claims, it is the examiner position that Formato, Fukuda and Sakuma’s composite ion exchange membrane possesses these properties.” Applicants respectfully disagree. As discussed above, the ion exchange composition from the combined teachings of Formato, Fukuda and Sakuma is not substantially identical to the claimed ion exchange compositions. For example, none of these references teaches or suggests a component represented by Chemical Formula 4 or Chemical Formula 7, as recited in claim 6 or 7. In addition,  $n:m$  in the instant claims represents the amount of the linking unit represented by Chemical Formula 2A relative to the amount of the linking unit represented by Chemical Formula 2B. Even assuming that Table 4-7 of Formato discloses linking units substantially

identical to the linking units as in claims 6 or 7, Formato, as well as Fukuda and Sakuma, is silent on the amount of a linking unit relative to another linking unit. Because the structures of the linking units have nothing to do with the relative amounts of these units in an ion exchange resin composition, one can not infer that the ratio of  $n/n+m$  in the ion exchange composition of the cited references would satisfy Mathematical Expressions 2 and 3, as recited in claims 6 and 7, respectively.

For at least the forgoing reasons, a prima facie case of obviousness has not been established.

Even assuming a prima facie case of obviousness, Applicants in the Response to Office Action filed October 30, 2008 presented unexpected results that a value of  $n/n+m$  satisfying Mathematical Expression 2 or 3, as recited in claims 6 or 7, leads to superior properties in terms of ion conductivity, swellability, and permeability of methanol. In response to these arguments, the Office Action states that the features (i.e. ion conductivity, swellability, and permeability of methanol) are not recited in the rejected claims (page 15, the first paragraph). Applicants submit that the advantageous properties (e.g. ion conductivity, swellability, and permeability of methanol) demonstrate the superior unexpected results associated with the limitation that  $n/n+m$  satisfies Mathematical Expression 2 or 3, a limitation that IS recited in claims 6 or 7. There is no requirement that the unexpected results themselves, associated with a limitation already in a claim, are actually recited in the claim. Instead, all arguments and evidence demonstrating unexpected results to rebut an alleged obviousness must be considered by the Office. *See* MPEP 2145.

For at least the foregoing reasons, claims 6-7 and all claims dependent therefrom, would not have been obvious over Formato, Fukuda and Sakuma. Withdrawal of the rejections is respectfully requested.

II. Applicants respectfully traverse the obviousness rejections of claims 6, 7, 23, 24, and 26-28 over Suzuki et al. (JP 2002-203576) in view of Fukuda, Sakuma, and McGrath.

The Office Action acknowledges that “Suzuki does not disclose the usage of instantly claimed sulfonated aromatic copolymer.” As discussed above, none of Fukuda, Sakuma, and McGrath teaches or suggests an composite ion exchange membrane comprising an ion exchange

resin including linking units represents by Chemical Formula 2A and linking units represented by Chemical Formula 2B with the structures of Ar<sub>1</sub>, Ar<sub>2</sub>, and Ar<sub>3</sub> as specified in claims 6 and 7. Furthermore, the cited references, even when taken in combination, fail to disclose Mathematical Expressions 2 and 3, as recited in claims 6 and 7, respectively.

For at least these reasons, claims 6-7 (and all claims dependent therefrom) would not have been obvious over Suzuki in view of Fukuda, Sakuma, and McGrath. Withdrawal of the rejections is respectfully requested.

### CONCLUSION

In the event that the filing of this Amendment along with a petition for a one-month extension of time is deemed not timely, applicants petition for an appropriate extension of time. The Commissioner is authorized to charge extensions of time and any other fees determined to be due (with the exception of the issue fee) and to credit any overpayment to Deposit Account No. 11-0600.

Respectfully submitted,  
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